

Is the French health insurance an efficient instrument for intragenerational redistribution?

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According to the French act that founded the public health insurance, equity and income redistribution² justify the public intervention in health insurance³.

Recent empirical studies focus on the equity in health care, evaluated by two kinds of analysis (Wagstaff & Van Doorslaer, 2000).

- the equity in financing is analyzed according to ability to pay;
- the equity in delivery is analyzed according to need of care.

However this literature does not fully respond to the question of redistribution because of the three following problems :

1/ equity and the redistributive effect of health insurance are two different theoretical questions :

- Equity deals with social justice in health care
- But the question of social health insurance redistribution is : "Taking as given a certain social preference for redistribution, is social health insurance an efficient instrument for redistributive policy"

2/ fields of analysis are different

- Equity analysis integrates the different sources of financing, both public (social insurance contribution) and private (private insurance premiums, and out-of-pocket payments of care)
- but the analysis of social health insurance redistributivity is restricted to public financing and the covered share of cares.

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² According to the French act of May 22, 1946 : " la réalisation de la sécurité sociale se traduit économiquement par une redistribution des revenus" (" The realisation of Social Security leads economically to income redistribution")

³ Public intervention in health insurance finds several theoretical justifications, such as failures in the insurance market (adverse selection and moral hazard), externalities, irrationality or paternalism (Poterba, 1994).

3/ methods are different

- equity in financing is analyzed independently of equity in delivery
- but redistribution corresponds to a global effect on income distribution, of both financing scheme and subsidies.

Then the redistributive effect of health insurance could be evaluated according to the benefit principle, by income group comparison of the ratio subsidies to health consumption/contribution, without taking account of the need of care.

Even if in-kind transfers or subsidies to consumption of some particular goods are always less efficient than cash transfers, these instruments for redistribution are theoretically justified by population targeting (Poterba, 1994)⁴.

Then Henriet & Rocher (1998) argue that :

"Public health systems, financed by taxation, are in principle, a good redistributive instrument, given that income and morbidity are negatively correlated".

However the negative correlation between income and morbidity has a consequence, less mentioned in the literature, the negative correlation between mortality and income.

We focus here on the redistributive impact of these two dimensions of social health inequalities, and particularly on differential mortality.

Our results suggest a strong social inequality of mortality in France, reducing the redistributive effect of health insurance.

Contents of the Communication :

1) Social Health Inequality and Redistribution

Some elements from the debate.

2) Death Inequality in France

An original empirical study of the link between income and male mortality in France.

⁴ In-kind transfers are justified by merit goods (Mulligan and Phillipson, 1999), paternalism and time inconsistencies (Geoffard, 2000) .

1. Inequality in Health and Redistribution

1.1 Life cycle analysis

To integrate the two dimensions of health income correlation, we consider a life cycle analysis.

1.1.1 Definitions

- The individual health insurance benefit is the sum of the benefits of each period of the life cycle.
- The health insurance will be an efficient instrument of redistribution if the scheme of contributions and subsidies of cares induces a *positive life cycle transfer* from the rich to the poor, according to permanent income opportunity.

For sake of simplicity, our analysis is restricted to intragenerational redistribution : we analyze the life cycle redistribution within a same cohort, regardless generational effects on health care consumption or financing.

1.1.2 Analysis Formulation :

Assuming an economy as simple as possible.

We suppose Individuals living two periods, one on activity, one on retirement.

There are two types of individual, different :

- by permanent income opportunities, Y_p and Y_r
- by health cares consumption : at each period i the consumption of the poor is a proportion α_i of the consumption of the rich.
- and probability of living the period of retirement, π .

The health insurance covers a fraction q of the health consumption and is financed by a linear taxation, with a lower rate at retirement. (r represents the decrease of income at retirement and the decrease of rate of taxation)

	1°period : Activity		2°period : Retirement		
	Subsidies of Cares	Contribution	Subsidies of Cares	Contribution	Probability of living the second period
Poor	$q.\alpha_1.C_1$	$t.Y_p$	$q.\alpha_2.C_2$	$t.r.Y_p$	$\pi_p=\pi$
Rich	$q.C_1$	$t.Y_r$	$q.C_2$	$t.r.Y_r$	$\pi_r=1$

Assuming the nullity of actualization rate, the health Insurance will be redistributive if the life cycle transfer from the rich to the poor is positive :

$$T = [q.\alpha_1.C_1 + q.\pi\alpha_2.C_2 - t(1+\pi r)Y_p] - [q.C_1 + q.C_2 - t(1+r)Y_r]$$

Given the health insurance equilibrium, the system will be redistributive if :

$$T > 0 \quad \text{if} \quad [\alpha_1.C_1 + \pi\alpha_2.C_2][Y_r(1+r)] > [C_1 + C_2][Y_p(1+\pi r)]$$

1.2 Inequality in Morbidity

1.2.1 Inequality in morbidity improves redistribution

If there is a positive correlation between morbidity and health cares, then social health inequalities improve health insurance redistribution :

$$\frac{\partial T}{\partial \alpha_1} = \frac{C_1(1+r)Y_r}{(Y_r(1+r) + Y_p(1+\pi r))} > 0$$

$$\frac{\partial T}{\partial \alpha_2} = \frac{\pi C_2(1+r)Y_r}{(Y_r(1+r) + Y_p(1+\pi r))} > 0$$

1.2.2 Assuming exogenous mortality

The life cycle analysis leads to the same conclusion than standard analysis. The system is redistributive if the income elasticity of cycle life health consumption is less than 1.

$$T > 0 \Leftrightarrow \left(\frac{\alpha_1 C_1}{Y_p} - \frac{C_1}{Y_r} \right) + r \left(\frac{\alpha_2 C_2}{r Y_p} - \frac{C_2}{r Y_r} \right) > 0$$

1. Redistribution analysis is not consistent with equity analysis.

If the health insurance is financed by linear taxation, the financing is not progressive, but proportional. Given social health inequalities, health delivery is not equitable if health expenditures are constant.

However this health insurance is redistributive in this case.

2. In the french case, the system seems to be redistributive because income elasticity of subsidized cares is less than 1, controlling for age.

Equivalent Income Classes	Health Expenses Index	Hospital Expenses Index	Physicians (SPS 1998)
1	97	123	80
2	96	110	94
3	90	85	98
4	99	95	110
5	106	88	112

(Source : Grignon & Polton (1998), from EPAS SPS appariement, 1992-95)

1.3 Inequality in Mortality

In life cycle analysis, the existence of a negative correlation between income and mortality is a strong determinant of redistribution.

1.3.1 Social death inequalities reduce the redistribution

With reasonable hypothesis on the increase of cares with age and on the decrease of income at retirement, the marginal benefit of living the second period is positive.

$$\frac{\partial T}{\partial \pi} > 0 \Leftrightarrow \frac{\alpha_2 C_2}{r Y_p} > \frac{(1 + \alpha_1) C_1 + C_2}{(1 + r) Y_r + Y_p}$$

Even if numerous studies have been paid attention to the question of endogeneity of mortality with income in United States (Kitagawa & Hauser, 1973, Mc Donough & al 1997), the correlation between mortality and income has never been estimated for the French case. As emphasizes Feinstein (1993), "data on mortality differentials in France are scanty" and some few studies only point out the differences by occupation-based social position (Mesrine 1999).

Even if occupation and earning are correlated, several main reasons lead us to analyze precisely the correlation between income and mortality :

- first we focus on the impact of health insurance on income distribution and not on transfers between social class,
- strong mortality differences by occupation could result from cultural habits or working conditions, without income effect,
- the large standard variation of income inside each social class reduces the quality of this indicator as a good proxy of income.

An empirical study of income mortality will be the aim of the second part of this paper.

1.3.2 Given this correlation between income and mortality, the contribution and consumption timing influences the redistribution.

1. The decrease of taxation at retirement reduces the redistribution.

$$\frac{\partial T}{\partial r} = (1 - \pi) Y_r Y_p \frac{(1 + \alpha_1) C_1 + (1 + \pi \alpha_2) C_2}{Y_r (1 + r) + Y_p (1 + \pi r)} > 0$$

This effect is inconsistent with equity analysis, where the decrease of contributions at retirement improves the progressivity indices for financing, because pensioners are more likely in the bottom income groups (Wagstaff & van Doorslaer, 2000).

The French social health insurance is essentially financed by contributions based on income and with decreasing rate at retirement. More recently, a new taxation (CSG) has slightly increased the share of contributions paid by pensioners, which improves the redistribution.

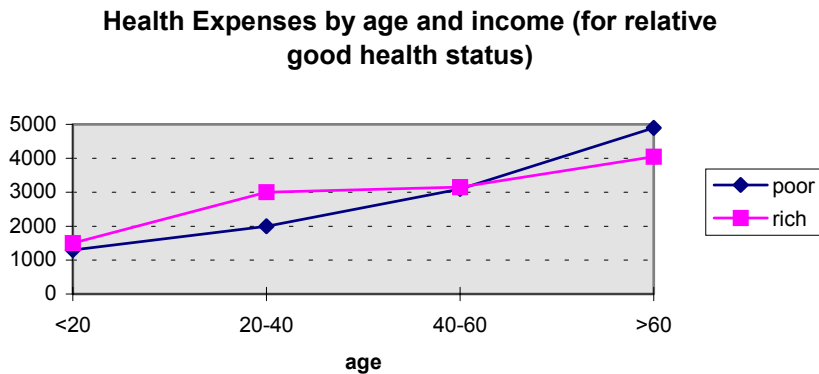
Contribution	Age <20	20-40	40-60	>60
Social Health Contribution	114.06	141.7	116.08	14.55
S H C + CSG	108.80	135.52	115.71	25.21

(Source : Couffinal & al (1998) from "Budgets des Familles" 1995)

2. The redistribution decreases with intertemporal substitution of cares, i.e. if the lower consumption of the poor in the first period is compensated by an higher consumption in the second period.

$$\frac{\partial T}{\partial \pi \partial \alpha_1} = -\frac{C_1 r(1+r)Y_r Y_p}{(Y_r(1+r) + Y_p(1+\pi r))^2} < 0$$

$$\frac{\partial T}{\partial \pi \partial \alpha_2} = \frac{C_2(1+r)Y_r(Y_r(1+r) + Y_p)}{(Y_r(1+r) + Y_p(1+\pi r))^2} > 0$$



(Source : Grignon & Polton (1998), from EPAS SPS appariement, 1992-95)

2.The Relation between Income and Male Mortality in France

2.1 Theoretical Background

Erlich and Chuma's extension (1990) of Grossman 's health capital model (1972) proposes two main explanations for this correlation :

- income has a direct effect on health, allowing much health expenditures and inciting to healthy behaviors.
- health status has a reverse selection effect on income, i.e. healthiest individuals are much able to work and to have a good career.

With respect to Erlich and Chuma's conclusions on the endogeneity of longevity, we propose an analysis of "the positive association between longevity and permanent income opportunities".

Then, there will be two steps in our method of analysis:

- we estimate permanent income based on current income data
- we test the impact of permanent income on probability of dying

2.2 Data

As early mentioned, there is no French study of the relation between income and death. This can be explained by the lack of income data in traditional demographic survey. Mortality studies are usually based on death certificates matched with census data. Now, these sources contain only occupation's data and no income's data.

To test the approach, we propose to construct on original database, based on two distinct databases.

2.2.1 "Patrimoine au Décès en 1988" ("Wealth at Death" Survey)

This survey is the only French survey with age at death and income. It consists on a sample of individuals died after 20 years old in 1988, issued from a representative demographic sample of 1% of the French population, and some individuals died in 1987, to guaranty the income representativity.

For this sample of death, the French fiscal administration has collected data from fiscal declaration on demographic characteristics, occupation, amount of wealth at death and household income, basis of taxation, from two years before the death.

Nevertheless generation effect on mortality and social characteristics forbid to link age at death and income. We need then a comparable sample of living to analyze the determinant of death.

2.2.2 "Revenus fiscaux en 1990" (Taxable Income Survey)

The French fiscal administration also collects regularly household income data, from fiscal declaration, for sample of representative households.

We use the survey realized in 1990 to construct a sample of individuals comparable to the sample of death.

2.2.3 The Dataset

We construct an sample of comparable individuals, all living at the end of 1987, by concatenation of both "Wealth at Death" Survey and "Taxable Income Survey". At the end of The year 1988, on part of this population is still alive and the other part of this population is dead. We can analyze death determinants.

January 1, 1988	Total Population	
January 1, 1989	Survival : "Taxable Income Survey"	Dead : "Wealth at Death"

2.3 Permanent income estimation

2.3.1 The Method

In order to estimate permanent income based on cross-sectional data, we use the method proposed by King and Dicks Mireaux (1982).

The permanent income is defined as normal age-ajusted income, explained by observable characteristics Z_i , such as occupation, and unobservable human capital, s_i , normally distributed.

$$\ln YP = Z_i\beta + s_i$$

It corresponds to human capital return, controlling for income-age profile. This definition of permanent income is near the concept of permanent income opportunities, used by Erlich & Chuma than the Friedman' definition, where the permanent income is the actualized sum of annual income. King and Kicks-Mireaux definition is most convenient to analyze the link between permanent income and mortality, because of mortality permanent income endogeneity.

The current income differs from permanent income for two reasons : the age-earning profile over the life cycle and the transitory component, normally distributed.

$$\ln Y_i = \ln YP_i + \alpha \text{Age}_i + u_{it}$$

The regression of income on age and observable characteristics give us an estimation of the observable characteristics annual returns :

$$\ln Y_i = \alpha \text{Age}_i + Z_i\beta + (s_i + u_{it})$$

To separate unobservable human capital s_i from the transitory income u_{it} , we use the minimum-variance estimator of the unobservable characteristic s_i given $(s_i + u_{it})$:

$$\text{where } s_i^e = \gamma (s_i + u_{it}) \\ \gamma = \sigma_s^2 / (\sigma_s^2 + \sigma_u^2)$$

The permanent income estimate is then the sum of age-ajusted estimate of income and a fraction γ of residual,

$$\ln YP_i^e = Z_i\beta^e + \gamma(s_i + u_{it})$$

We assume a value for the individual effect γ , based on the result on a longitudinal french earning panel (panel DADS, INSEE) (Barge & Payen, (1982)).

Age	Individual effect estimator
<25	0.61
25<=age<=29	0.73
30<=age<=34	0.79
35<=age<=39	0.81
Age>=40	0.83

So we restrict our analysis :

- to men : because the correlation between occupation and household income is stronger for men than for women.
- to individuals between 25 and 65 years old : because data on occupation before retirement is not available for living pensioners, except for executive workers.
- to wage-earning, for which permanent income can be much reasonably estimated on cross-sectional data;

Finally, we have a sample of 13 375 individuals, 439 death and 12936 living.

2.3.2 Main Results

- Age profile⁵ represents both carrier effects and cohort effect on income
- The large effect of marital status is explained by the fact that income corresponds to household income. Then the marriage dummy is a proxy for double income household.
- According permanent income estimation based on the survey "Actifs Financiers" (Lollivier & Verger,1999), the parameters estimate and the normality of residuals are satisfying.

⁵ In each age group, the age is a linear function.

2.4 Probability of Death

2.4.1 The Method

With a logit model, we tested the impact on the probability of dying before 65 of :

- Age
- Equivalent Permanent Income Quintile⁶
- Occupation
- Marital Status
- Region

2.4.2 Main results

- Mortality decreases with permanent income
- Controlling for permanent income, occupation is less significant : only non manual occupation still increase death probability.
- Mortality increases with age.
- Single and widowed people have higher death probability.
- Two Regions have particular effect :
 - Nord : alcoholism, suicide ?
 - Sud Ouest : French paradox ?

Conclusion

Our results suggest a strong correlation between income and mortality.

This death inequality limits the efficiency of social health insurance for redistribution policy.

These results could be generalized as all longevity-based transfer systems, like public pensions. This may be regressive contrarily to the hypothesis of neutrality since poor recipients are less likely to live until the age of retirement.

The original construction of the database used in this study allowed us to link income and mortality for France. However, the results could be contingent to the data, especially while the studied phenomena corresponds perfectly to the database concatenation. More over testing the sense of causality with this data was not allowed with cross-sectional data. It is then not possible to separate the selection hypothesis from an effect of income on mortality.

⁶ the equivalence scale is the root square of the people number in the household.

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Permanent Income Estimation

Variables		Coeff	T Student	Significativity
Age Profile	<30 Executive	0.093	6.244	1%
	<30 Non Executive	0.010	1.767	10%
	30-40 E	0.028	8.643	1%
	30-40 N.E	0.017	8.177	1%
	40-50 E	0.001	0.256	NS
	40-50 N.e	-0.008	-2.876	1%
	50-60 E	-0.0002	-0.053	NS
	50-60 N.E	-0.0002	-0.048	NS
	>=60*activity*E	0.108	6.411	1%
	>=60*activity*N E	-0.015	-0.722	NS
	>=60*pension*E	0.027	1.363	NS
	>=60*pension*N.E	0.006	0.655	NS
Occupation	3:Executive	0.475	16.781	1%
	4:Intermediate	Ref	Ref	Ref
	5:Non Manual	-0.247	-16.210	1%
	6:Manual	-0.478	-37.271	1%
	73:Executive Pensioners	0.252	4.058	1%
	73:Non Executive Pensioners	-0.351	-10.397	1%
Marital status	Single	-0.510	-37.711	1%
	Married	Ref	Ref	Ref
	Widowed	-0.315	-6.826	1%
	Divorced	-0.434	-22.153	1%
Region	Ile de France	0.115	8.274	1%
	Bassin Parisien	Ref	Ref	Ref
	Nord	-0.062	-3.179	1%
	Est	-0.041	-2.327	5%
	Ouest	-0.040	-2.583	1%
	Sud Ouest	-0.048	-2.837	1%
	Centre Est	-0.028	-1.742	10%
	Méditerranée	-0.126	-7.215	1%
Intercept		12.095	642.216	1%
Ajusted R2 : 0.5300		Fisher : 559.59		Sample :13375

Death Probability Estimation

Variable	Model with Income				without Income		
	Coeff	T-Student	Prob	Odds Ratio	Coeff	T-Student	
Age <60	<30	-1.712	4.930	1 %	0.180	-1.744	5.026
	30-39	-1.117	5.611	1 %	0.327	-1.096	5.504
	40-49	Ref	Ref	Ref			
	50-59	1.160	8.022	1 %	3.191	1.085	7.538
Age<66	Activity	2.279	10.178	1 %	9.763	2.084	9.463
	E Pension	1.922	6.425	1 %	6.833	2.257	7.655
	N E Pension	2.414	12.095	1 %	11.182	2.731	13.944
Permanent Income Quintile	Q1	1.703	7.149	1 %	5.490		
	Q2	1.647	7.181	1 %	5.191		
	Q3	1.263	5.540	1 %	3.536		
	Q4	1.120	5.068	1 %	3.065		
	Q5	Ref	Ref	Ref			
Occupation (non pensioners)	Executive	Ref	Ref	Ref			
	Intermediate	-0.075	0.349	n.s.	0.928	0.449	2.167
	Non manual	0.403	1.847	10 %	1.496	1.086	5.310
Marital Status	Manual	0.739	3.955	1 %	2.094	1.501	9.019
	Single	0.404	2.440	5 %	1.497	0.446	2.721
	Married	Ref	Ref	Ref			
	widowed	0.708	2.372	5 %	2.029	0.665	2.252
Region	Divorced	0.280	1.358	n.s.	1.323	0.278	1.354
	Ile de France	0.139	0.836	n.s.	1.149	0.013	0.077
	Bassin Parisien	Ref	Ref	Ref			
	Nord	0.589	2.980	1 %	1.802	0.654	3.341
	Est	0.267	1.396	n.s.	1.305	0.320	1.691
	Ouest	-0.046	0.244	n.s.	0.955	-0.011	0.057
	Sud Ouest	-0.397	1.816	10 %	0.673	-0.342	1.576
	Centre Est	0.003	0.014	n.s.	1.003	0.031	0.169
	Méditerranée	-0.139	0.679	n.s.	0.870	-0.064	0.314
INTERCPT	-5.552	21.986			-4.746	23.436	

	Intercept	Model with Income	Model without Income
AIC	3865.243	3259.114	3320.446
SC	3872.745	3439.142	3320.446
-2 log L	3863.243	3211.114	3280.446